APPENDIX C

CONVERSIONS & CALCULATIONS

Effective application of pesticides depends on many factors. One of the more important is to correctly calculate the amount of material needed. Unless you have the correct amount of pesticide in your tank mix, even a correctly calibrated sprayer can apply the wrong rate.

Manufacturers provide application rate instructions on every pesticide label. Due to the variety of ways in which these recommendations are stated (such as lbs. of active ingredient (a.i.) per acre, lbs. of formulation per 100 gal. of spray, or ozs, of a.i. per 1,000 sq. ft.) it is often necessary to adapt the recommendations to different areas and volumes, or even other units. Sometimes the amount of active ingredient must be converted to the amount of actual product. This process can be very confusing.

Conversion Factors

To use this conversion table, multiply the number in the left-hand column by the conversion factor in the center column. This converts your original number to the units in the right-hand column.

Examples:

1.0 gallon equals how many ounces?
1.0 gallon x 128 = 128 fluid ounces

2.5 gallons equals how many ounces?
2.5 gallons x 128 = 320 fluid ounces

Multiply	By	To get	Multiply	By	To get
Acres	43,560	Square feet	Gallons	128	Ounces (liquid)
Acres	4,840	Square yards	Gallons	8	Pints (liquid)
Acres	0.405	Hectares	Gallons	4	Quarts (liquid)
Bushels	64	Pints	Gallons, H_2O	8.345	Pounds of water
Bushels	32	Quarts	Grams	0.001	Kilograms
Cubic feet	1,728	Cubic inches	Grams	1,000	Milligrams
Cubic feet	0.037	Cubic yards	Grams	0.035	Ounces
Cubic feet	7.481	Gallons	Grams per liter	1,000	Parts per million
Cubic feet	59.84	Pints (liquid)	Hectares	2.47	Acres
Cubic feet	29.92	Quarts (liquid)	Inches	2.54	Centimeters
Cups	8	Ounces (liquid)	Kilograms	1,000	Grams
Cups	16	Tablespoons	Kilograms	2.205	Pounds
Feet	30.48	Centimeters	Kilometers	3,281	Feet
Feet	12	Inches	Kilometers	0.621	Miles
Feet	0.305	Meters	Liters	0.264	Gallons
Feet	1/3 or 0.333	Yards	Liters	2.113	Pints (liquid)
Gallons	3.785	Liters	Liters	1.057	Quarts (liquid)

Multiply	By	To get	Multiply	By	To get
Meters	100	Centimeters	Pints (liquid)	0.5	Quarts (liquid)
Meters	3.281	Feet	Pounds	453.592	Grams
Meters	39.37	Inches	Pounds	16	Ounces
Meters	0.001	Kilometers	Pounds	0.0005	Tons
Meters	1,000	Millimeters	Quarts	2	Pints
Meters	1.094	Yards	Quarts	0.25	Gallons
Miles	5,280	Feet	Quarts	0.946	Liters
Miles	1,760	Yards	Quarts (liquid)	32	Ounces (liquid)
Miles per hour	88	Feet per minute	Quarts (liquid)	2	Pints (liquid)
Miles per hour	1.467	Feet per second	Rods	16.5	Feet
Miles per minute	88	Feet per second	Square miles	640	Acres
Miles per minute	60	Miles per hour	Square yards	9	Square feet
Ounces (dry)	28.35	Grams	Square yards	1,296	Square inches
Ounces (dry)	0.063	Pounds	Tablespoons	3	Teaspoons
Ounces (liquid)	0.063	Pints (liquid)	Temperature (°C) + 17.98	1.8	Temperature °F.
Ounces (liquid)	0.031	Quarts (liquid)	Temperature (°F) – 32	0.555	Temperature °C.
Parts per million	0.001	Grams per liter	Tons	907.185	Kilograms
Pecks	16	Pints (dry)	Tons	2,000	Pounds
Pecks	8	Quarts (dry)	Yards	3	Feet
Pints	0.125	Gallons	Yards	36	Inches
Pints	0.473	Liters	Yards	0.914	Meters
Pints	2	Cups			
Pints (liquid)	16	Ounces (liquid)			

PESTICIDE CALCULATIONS

Formulations such as wettable and soluble powders, emulsifiable concentrates, and flowables are sold as concentrates and must be diluted in the spray tank with an appropriate carrier. Water is the most common carrier, but kerosene, oil, and other liquids are sometimes used. Below are examples of how to properly calculate how much pesticide should be added to a spray tank.

Mixing Soluble and Wettable Powders

Pounds per 100 gallons Directions for wettable or soluble powders may be given in pounds of pesticide formulation per 100 gallons of carrier. You must know the capacity in gallons of your spray tank (or the number of gallons you will be adding to your spray tank if the job requires only a partial tank load). Then use the following formula:

$$\frac{\textbf{Gallons in tank} \times \textbf{Pounds per 100 gallons recommended}}{\textbf{100 gallons}} = \textbf{Pounds needed in tank}$$

Example:

Your spray tank holds 500 gallons. The label calls for 2 pounds of formulation per 100 gallons of water. How many pounds of formulation should you add to the tank?

$$\frac{\text{500 gallons} \times \text{Pounds per 100 gallons (2)}}{\text{100 gallons}} = \text{Pounds needed in tank (10)}$$

$$500 \times 2 \div 100 = 10$$

You should add 10 pounds to the tank.

Example:

You need to spray only one acre and your equipment is calibrated to spray 60 gallons per acre. The label calls for 2 pounds of formulation per 100 gallons of water. How many pounds of formulation should you add to the tank to make 60 gallons of finished spray?

$$\frac{\text{Gallons in tank (60)} \times \text{Pounds per 100 Gallons (2)}}{\text{100 gallons}} = \text{Pounds needed in tank (1.2, or 19 oz)}$$

$$60 \times 2 \div 100 = 1.2$$

Number of pounds to add is 1.2, or 19 oz.

Pounds per acre The label may list the recommended dosage as pounds per acre. If the job requires a full tank, you must know how many gallons your equipment applies per acre and spray tank capacity. Use these formulas:

$$\frac{\text{Gallons in tank}}{\text{Gallons applied per acre}} = \text{Acres sprayed per tankful}$$

Acres sprayed per tank X Pounds formulation per acre = Pounds formulation needed in tank

Example:
Your sprayer applies 15 gallons per acre and your tank holds 400 gallons. The label rate is 3 pounds of formulation per acre.

$$\frac{\text{Gallons in tank (400)}}{\text{Gallons per acre (15)}} = \text{Acres sprayed per tankful (26.7)}$$

400 ÷ 15 = 26.7

Acres sprayed per tankful (26.7) X Pounds formulation per acre (3) = Pounds formulation needed in tank (80.1)

26.7 X 3 = 80.1

Add 80 pounds of pesticide formulation to the tank.

If the job requires less than a full tank, you must know how many acres you wish to treat and how many gallons your sprayer is pumping per acre. You must figure both the number of gallons needed in the tank and the pounds of formulation to add. Use these formulas:

Gallons per acre X Acres to be treated = Gallons needed in tank

Acres to be treated X Pounds formulation per acre = Pounds formulation needed in tank

Example:
You wish to spray 3.5 acres and your equipment is applying 15 gallons per acre. The label rate is 3 pounds per acre.

Gallons per acre (15) X Acres to be treated (3.5) = Gallons needed in tank (52.5)

15 X 3.5 = 52.5

Acres to be treated (3.5) X Pounds formulation per acre (3) = Pounds formulation needed in tank (10.5)

3.5 X 3 = 10.5

If the recommended dosage is given as pounds of active ingredient (a.i.) per acre, you must first convert that figure to pounds of formulation per acre. Use the following formula:

$$\frac{\text{Pounds of a.i. per acre X 100}}{\text{Percent of a.i. in formulation}} = \text{Pounds formulation per acre}$$

Then follow the formulas listed above under "pounds per acre" to find the pounds of formulation to add to your tank.

Example:
You wish to apply 2 pounds of active ingredient per acre. Your formulation is 80 percent WP.

$$\frac{\text{Pounds of a.i. per acre (2) X 100}}{\text{Percent a.i. in formulation (80)}} = \text{Pounds formulation per acre (2.5)}$$

2 X100 ÷ 80 = 2.5

Mixing Liquid Formulations

Rates for liquid formulations (EC, F, etc.) are often listed as pints, quarts, or gallons per 100 gallons or per acre. Make these calculations as you did above for pounds per 100 gallons or pounds per acre, but in the formulas substitute the appropriate liquid measure for "pounds."

Example:
The label rate is 2 pints of pesticide formulation per 100 gallons of water. Your spray tank holds 300 gallons.

$$\frac{\text{Gallons per tank (300) X Pints per 100 gallons (2)}}{\text{100 gallons}} = \text{Pints formulation needed in tank (6)}$$

300 X 2 ÷ 100 = 6

Example:
Your sprayer applies 22 gallons per acre and your tank holds 400 gallons. The label rate is 1.5 quarts per acre.

$$\frac{\text{Gallons in tank (400) X Quarts per acre (1.5)}}{\text{Gallons per acre (22)}} = \text{Quarts needed in tank (27.3)}$$

400 X 1.5 ÷ 22 = 27.3

If the recommendation for a liquid formulation is listed as pounds of active ingredient per acre, you must first convert that figure to gallons of formulation to apply per acre. The label of a liquid formulation always tells how many pounds of active ingredient are in one gallon of the concentrated formulation (4 EC has 4 pounds of active ingredient per gallon; 6 EC contains 6 pounds per gallon, etc.)

$$\frac{\text{Pounds of a.i. needed per acre}}{\text{Pounds of a.i. per gallon of formulation}} = \text{Gallons of formulation per acre}$$

Example:
The recommendation is for 1 pound of active ingredient per acre. You purchased an 8 EC, which contains 8 pounds of active ingredient per gallon. Your tank holds 500 gallons and is calibrated to apply 25 gallons per acre.

$$\frac{\text{Pounds a.i. to apply per acre (1)}}{\text{Pounds a.i. per gallon (8)}} = \text{Gallons per acre (1/8, or 1 pint)}$$

1 ÷ 8 = 0.125 (1/8)

$$\frac{\text{Gallons in tank (500)}}{\text{Gallons per acre (25)}} = \text{Acres per tankful (20)}$$

500 ÷ 25 = 20

Acres per tankful (20) X Gallons per acre (1/8 or .125) = Gallons to add to tank (2.5)

20 X .125 = 2.5

Square Feet vs. Acre Mixing

The label rate is sometimes given in pounds, pints, quarts, or gallons per 1,000 square feet. If you have calibrated your equipment in terms of 1,000 square feet, you must adjust the formulas above from an acre to 1,000 square feet. The following formulas may be used with either liquid or dry formulations:

$$\frac{\text{Gallons per tank}}{\text{Gallons applied per 1,000 square feet by equipment}} = \text{Number of 1,000 square feet sections per tankful}$$

Number of 1,000 square feet sections sprayed per tankful X pints, quarts, gallons, or pounds of formulation needed per 1,000 square feet = Amount of formulation to add to tank.

However, if you have calculated the area you are to treat in acres, you must convert the 1,000-square-foot rate to a rate per acre as follows:

$$\frac{\text{43,560 (sq. ft. per acre)}}{\text{1,000 square feet}} = 43.5$$

Pints, quarts, gallons, or pounds per 1,000 square feet X 43.5 = Pints, quarts, gallons, or pounds of formulation to apply per acre

To convert from the rate per acre to a rate per 1,000 square feet (or 100 square feet):

$$\frac{\text{Pints, quarts, gallons, or pounds of formulation recommended per acre}}{\text{43.5 (435 for 100 sq. ft.)}} = \text{Pints, quarts, gallons, or pounds of formulation per 1,000 square feet (or 100 sq. ft.)}$$

From Penn State *Pesticide Education Manual*, third edition

The section on conversion tables was adapted from the *Pocket Pesticide Calibration Guide*, compiled by Frank Boys and Frank Murphey, University of Delaware.

The section on pesticide calculations was adapted from *Applying Pesticides Correctly: A Guide for Private and Commercial Applicators*, North Carolina State University.